

CLAIMS

What is claimed is:

1. An electronic device package comprising:
a substrate having a first surface, an opposing second surface, and a plurality of edge surfaces extending between the first surface and the second surface around a perimeter of the substrate;
at least one contact pad on the first surface of the substrate;
at least one attachment pad on the second surface of the substrate;
at least one conductive element electrically connecting the at least one contact pad and the at least one attachment pad; and
a housing structure formed on the substrate and comprising a plurality of raised sidewalls extending along the perimeter of the substrate defining a cavity in the housing structure, wherein the housing structure extends across a bottom surface of the cavity to cover substantially all of the first surface of the substrate and includes at least one aperture in the bottom surface of the cavity exposing the at least one contact pad through the housing structure.
2. The electronic device package of claim 1, wherein the housing structure covers the plurality of edge surfaces of the substrate.
3. The electronic device package of claim 2, further comprising at least one protrusion extending from at least one edge surface of the plurality of edge surfaces.
4. The electronic device package of claim 3, wherein the at least one protrusion comprises a tie bar extending perpendicularly from the at least one edge surface.
5. The electronic device package of claim 4, wherein the tie bar is connected to another substrate of another electronic device package.

6. The electronic device package of claim 1, wherein the housing structure covers substantially all of the second surface of the substrate and includes at least one aperture exposing the at least one attachment pad through the housing structure.

7. The electronic device package of claim 1, wherein the housing structure is formed from one of a mold compound, an epoxy, and a photocurable polymer or resin.

8. The electronic device package of claim 1, wherein the at least one contact pad comprises a plurality of contact pads and the at least one aperture in the bottom surface of the cavity comprises a plurality of apertures, each aperture of the plurality of apertures exposing a single contact pad of the plurality of contact pads.

9. The electronic device package of claim 1, wherein the at least one contact pad comprises a plurality of contact pads and the at least one aperture in the bottom surface of the cavity comprises a plurality of apertures, each aperture of the plurality of apertures exposing at least two contact pads of the plurality of contact pads.

10. The electronic device package of claim 1, further comprising an electronic device sensitive to light or other radiation mounted within the cavity of the housing structure and having at least one bond pad.

11. The electronic device package of claim 10, further comprising at least one bond wire electrically connecting the at least one bond pad to the at least one contact pad.

12. The electronic device package of claim 11, wherein the at least one bond wire is bonded directly to the at least one contact pad within the at least one aperture.

13. The electronic device package of claim 12, further comprising a sealant material substantially filling the at least one aperture.

14. The electronic device package of claim 11, further comprising a conductive material filling the at least one aperture exposing the at least one contact pad to a level that is substantially even with the bottom surface of the cavity, and wherein the at least one wire bond is bonded to the conductive material.

15. The electronic device package of claim 14, further comprising a sealant material deposited over the conductive material.

16. The electronic device package of claim 10, further comprising a conductive material filling the at least one aperture exposing the at least one contact pad to a level that is substantially even with the bottom surface of the cavity, and wherein the at least one bond pad is attached to the conductive material in a flip-chip configuration.

17. The electronic device package of claim 16, further comprising a sealing material filling a gap between the electronic device and the bottom surface of the cavity.

18. The electronic device package of claim 10, further comprising a ledge formed in the plurality of raised sidewalls of the housing structure and surrounding the cavity.

19. The electronic device package of claim 18, further comprising at least one channel formed in at least one sidewall of the plurality of raised sidewalls and extending from the ledge to the bottom surface of the cavity.

20. The electronic device package of claim 19, further comprising a sealing well formed in the housing structure adjacent to a junction of the ledge and the at least one channel.

21. The electronic device package of claim 19, further comprising a transparent cover supported by the ledge and covering the cavity.

22. The electronic device package of claim 21, further comprising a sealant material adhesively bonding the transparent cover to the housing structure and covering the bottom surface of the cavity.

23. The electronic device package of claim 1, wherein the at least one attachment pad is electrically connected to a higher-level electronic assembly.

24. A method of forming an electronic device package comprising:
providing a substrate having a first surface, an opposing second surface, and a plurality of edge surfaces extending between the first surface and the second surface around a perimeter of the substrate;
forming at least one contact pad on the first surface of the substrate;
forming at least one attachment pad on the second surface of the substrate that is electrically connected to the at least one contact pad;
covering substantially all of the first surface of the substrate with a layer of material including a cavity having sidewalls and a bottom surface formed from the layer of material; and
forming at least one aperture in the bottom surface of the cavity to expose the at least one contact pad through the layer of material.

25. The method of claim 24, further comprising forming the layer of material from a mold compound.

26. The method of claim 25, wherein covering substantially all of the first surface of the substrate comprises at least partially curing the mold compound onto the first surface of the substrate within a molding tool.

27. The method of claim 25, wherein covering substantially all of the first surface of the substrate comprises:

at least partially curing the mold compound in a molding tool; and
attaching the at least partially cured mold compound to the first surface of the substrate with an adhesive material.

28. The method of claim 24, further comprising covering the plurality of edge surfaces of the substrate with the layer of material.

29. The method of claim 28, wherein covering the plurality of edge surfaces comprises:
forming a plurality of protrusions extending from the plurality of edge surfaces;
placing the substrate into a mold cavity such that at least some of the plurality of protrusions provide a space between the plurality of edge surfaces and an interior surface of the mold cavity;
filling the space between the plurality of edge surfaces and the interior surface of the mold cavity with a mold compound; and
at least partially curing the mold compound onto the edge surfaces of the substrate.

30. The method of claim 29, wherein forming a plurality of protrusions extending from the plurality of edge surfaces comprises forming at least one of the plurality of protrusions as a tie bar that connects the substrate to another substrate of another electronic device package.

31. The method of claim 24, wherein covering substantially all of the first surface of the substrate with a layer of material comprises forming superimposed layers of an at least partially cured material onto the first surface of the substrate.

32. The method of claim 31, wherein forming superimposed layers of an at least partially cured material comprises:
dispensing a liquid or gel material onto the first surface of the substrate; and
at least partially curing the liquid or gel material.

33. The method of claim 31, wherein forming superimposed layers of an at least partially cured material comprises:
disposing a volume of photocurable liquid above the first surface of the substrate; and
selectively curing portions of the volume of photocurable liquid to form the superimposed layers of the at least partially cured material.

34. The method of 24, further comprising:
covering substantially all of the second surface of the substrate with the layer of material; and
forming at least another aperture to expose the at least one contact pad through the layer of material.

35. The method of claim 24, wherein forming at least one contact pad comprises forming a plurality of contact pads and wherein forming at least one aperture in the bottom surface of the cavity comprises forming a plurality of apertures, each aperture of the plurality of apertures exposing a single contact pad of the plurality of contact pads.

36. The method of claim 24, wherein forming at least one contact pad comprises forming a plurality of contact pads and wherein forming at least one aperture in the bottom surface of the cavity comprises forming a plurality of apertures, each aperture of the plurality of apertures exposing at least two contact pads of the plurality of contact pads.

37. The method of claim 24, further comprising mounting an electronic device sensitive to light or other radiation within the cavity.

38. The method of claim 37, further comprising electrically connecting at least one bond pad of the electronic device to the at least one contact pad with at least one wire bond.

39. The method of claim 38, further comprising directly attaching the at least one wire bond to the at least one contact pad within the at least one aperture.

40. The method of claim 39, further comprising substantially filling the at least one aperture with sealant material.

41. The method of claim 38, further comprising:
filling the at least one aperture with a conductive material to a level that is substantially even with
the bottom surface of the cavity; and
attaching the at least one wire bond to the conductive material.

42. The method of claim 41, further comprising depositing a sealant material over the conductive material.

43. The method of claim 37, further comprising:
filling the at least one aperture with a conductive material to a level that is substantially even with
the bottom surface of the cavity; and
attaching at least one bond pad of the electronic device directly to the conductive material.

44. The method of claim 43, further comprising filling a gap between the electronic device and the bottom surface of the cavity with a sealant material.

45. The method of claim 37, further comprising:
forming a ledge in the layer of material surrounding the cavity; and
covering the cavity with a transparent cover supported by the ledge.

46. The method of claim 45, further comprising:
applying a sealant material to simultaneously adhesively bond the transparent cover to the layer of material and cover the bottom surface of the cavity.

47. The method of claim 46, wherein applying the sealant material comprises injecting the sealant material into at least one runner surrounding the transparent cover and at least one runner extending from the ledge to the bottom of the cavity.

48. The method of claim 24, further comprising attaching the at least one attachment pad to a higher-level electronic assembly.